Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 1-56 (Canceled).

57. (Currently Amended): A method of modifying a metal oxide film formed on a surface of a target process object, the method comprising:

loading the target process object including the metal oxide film formed thereon into a process vessel;

feeding oxygen gas into an ozone generator connected to the process vessel, and generating a process gas containing ozone in the ozone generator;

supplying the process gas from the ozone generator into the process vessel, wherein the process gas is supplied from a showerhead disposed above the target process object in the process vessel, and the showerhead comprises gas injection pipes arrayed to form a grid and having gas injection holes formed in the gas injection pipes and directed into the process vessel toward the target process object;

exciting the process gas in the process vessel by a gas exciting system provided on the process vessel, thereby generating active oxygen atoms from the process gas; and

exposing the metal oxide film to the active oxygen atoms to modify the metal oxide film.

58. (Previously Presented): The method according to Claim 57, wherein the gas exciting system comprises a system selected from the group consisting of:

a heating system and a UV radiating system.

59-61 (Canceled).

62 (Previously Presented): The method according to Claim 57, wherein N_2 gas or N_2 gas along with H_2 gas for increasing generation efficiency of ozone is fed into the ozone generator when the process gas is generated.

63 (Previously Presented): The method of Claim 57, wherein:

a pressure in the process vessel is set to fall in a range of 0.1 to 600 Torr when the metal oxide film is modified.

64. (Previously Presented): The method of Claim 57, wherein:

a temperature of the target process object is set to fall in a range of 320°C to 700°C when the metal oxide film is modified.

65. (Previously Presented): The method of Claim 57, wherein:

a pressure in the process vessel is set to fall in a range of 0.1 to 50 Torr when the metal oxide film is modified.

66. (Previously Presented): The method of Claim 65, wherein:

a temperature of the target process object is set to fall in a range of 400°C to 700°C when the metal oxide film is modified.

67. (Previously Presented): The method of Claim 57, wherein the metal oxide film consists essentially of a material selected from a group consisting of:

tantalum oxide,

titanium oxide,

zirconium oxide,

barium oxide,

strontium oxide,

niobium oxide,

hafnium oxide,

yttrium oxide, and

lead oxide.

68. (Cancelled).

69. (Currently Amended): A method of modifying a metal oxide film formed on a surface of a target process object, the method comprising:

loading the target process object including the metal oxide film formed thereon into a process vessel;

feeding oxygen gas into an ozone generator connected to the process vessel, and generating a process gas containing ozone in the ozone generator;

supplying the process gas from the ozone generator into the process vessel, wherein the process gas is supplied from a showerhead disposed above the target process vessel, and the showerhead comprises gas injection pipes arrayed to form a grid and having gas injection holes formed in the gas injection pipes and directed into the process vessel toward the target process object;

exciting the process gas in the process vessel, thereby generating active oxygen atoms from the process gas, while heating an interior of the process vessel by a heater through a worktable on which the target process abject is placed; and

exposing the metal oxide film to the active oxygen atoms to modify the metal oxide film.

70 (Previously Presented): The method according to claim 69, wherein N_2 gas or N_2 gas along with H_2 gas for increasing generation efficiency of ozone is fed into the ozone generator when the process gas is generated.

71 (Previously Presented): The method of Claim 69, wherein:

a pressure in the process vessel is set to fall in a range of 0.1 to 600 Torr when the metal oxide film is modified.

72 (Previously Presented): The method of Claim 69, wherein:

a temperature of the target process object is set to fall in a range of 320°C to 700°C when the metal oxide film is modified.

73. (Previously Presented): The method of Claim 69, wherein:

a pressure in the process vessel is set to fall in a range of 0.1 to 50 Torr when the metal oxide film is modified.

74. (Previously Presented): A method according to claim 73, wherein:

a temperature of the target process object is set to fall in a range of 400°C to 700°C when the metal oxide film is modified.

75. (Previously Presented): The method of Claim 69, wherein the metal oxide film consists essentially of a material selected from a group consisting of:

tantalum oxide,

titanium oxide,

zirconium oxide,

barium oxide,

strontium oxide,

niobium oxide,

hafnium oxide,

yttrium oxide, and

lead oxide.

76. (Cancelled).

77. (Currently Amended): A method of modifying a metal oxide film formed on a surface of a target process object, the method comprising:

loading the target process object including the metal oxide film formed thereon into a process vessel;

supplying the process gas containing oxygen atoms into the process vessel, wherein the process gas is supplied from a showerhead disposed above the target process object in the process vessel, and the showerhead comprises gas injection pipes arrayed to form a grid and having gas injection holes formed in the gas injection pipes and directed into the process vessel toward the target process object;

exciting the process gas in the process vessel by irradiating the process gas with UV rays emitted from a UV radiating system provided above the showerhead ~~on the process vessel~~, thereby generating active oxygen atoms from the process gas; and

exposing the metal oxide film to the active oxygen atoms to modify the metal oxide film.

78. (Previously Presented): A method according to Claim 77, wherein the UV radiating system is set to emit UV rays having a wavelength of 180 nm or less.

79. (Previously Presented): The method of Claim 77, wherein:

a pressure in the process vessel is set to fall in a range of 0.1 to 600 Torr when the metal oxide film is modified.

80. (Previously Presented): The method of Claim 77, wherein:

a temperature of the target process object is set to fall in a range of 320°C to 700°C when the metal oxide film is modified.

81. (Previously Presented): The method of Claim 77, wherein:

a pressure in the process vessel is set to fall in a range of 0.1 to 50 Torr when the metal oxide film is modified.

82. (Previously Presented): The method of Claim 81, wherein:

a temperature of the target process object is set to fall in a range of 400°C to 700°C when the metal oxide film is modified.

83. (Previously Presented): The method of Claim 77, wherein the metal oxide film consists essentially of a material selected from a group consisting of:

tantalum oxide,

titanium oxide,

zirconium oxide,

barium oxide,

strontium oxide,

niobium oxide,

hafnium oxide,

yttrium oxide, and

lead oxide.

84. (Canceled)

85. (Previously Presented): The method of Claim 77, wherein:

the process gas contains at least one of oxygen, ozone, and N_2O.

86. (Currently Amended): A method according to Claim 57, wherein the gas exciting system comprises a UV radiating system configured to irradiate the process gas with UV rays, the showerhead is disposed between the UV radiating system and the target process object, and the gas injection pipes arrayed to form a grid of the showerhead have ~~that has~~ a projection area projected on the target process object, which is smaller than 20% of a surface area that the target process object has.

87. (Previously Presented): A method according to Claim 86, wherein the process vessel has a transmission window disposed at a ceiling, the showerhead is disposed below the transmission window, and the UV radiating system is disposed above the transmission window.

88. (Currently Amended): A method according to Claim 77, wherein the showerhead is disposed between the UV radiating system and the target process object, and the gas injection pipes arrayed to form a grid of the showerhead have ~~that has~~ a projection area projected on the target process object, which is smaller than 20% of a surface area that the target process object has.

89. (Previously Presented): A method according to claim 88, wherein the process vessel has a transmission window disposed at a ceiling, the showerhead is disposed below the transmission window, and the UV radiating system is disposed above the transmission window.

90. (Currently Amended): A method of modifying a metal oxide film formed on a surface of a target process object, the method comprising:

placing the target process object including the metal oxide film formed thereon on a worktable disposed in a process vessel;

supplying a process gas containing at least one of O_2, ozone, and N_2O into the process vessel, wherein the process gas is supplied from a showerhead disposed above the target process object in the process vessel, and the showerhead comprises gas injection pipes arrayed to form a grid and having gas injection holes formed in the gas injection pipes and directed into the process vessel toward the target process object;

generating active oxygen atoms from the process gas in the process vessel by an active oxygen generating system provided on the process vessel; and

exposing the metal oxide film to the active oxygen atoms to modify the metal oxide film.

91. (Previously Presented): A method according to claim 90, wherein the active oxygen generating system comprises a system selected from the group consisting of a heating

system configured to heat the target process object and a UV radiating system configured to irradiate the process gas with UV rays.

92. (Currently Amended): A method according to claim 90 wherein the active oxygen generating system comprises a UV radiating system configured to irradiate the process gas with UV rays, the showerhead is disposed between the UV radiating system and the target process object, and the gas injection pipes arrayed to form a grid of the showerhead ~~that has~~ have a projection area projected on the target process object, which is smaller than 20% of a surface area that the target process object has.

93. (Previously Presented): A method according to claim 92, wherein the process vessel has a transmission window disposed at a ceiling, the showerhead is disposed below the transmission window, and the UV radiating system is disposed above the transmission window.

94. (Previously Presented): A method according to claim 90, further comprising:

rotating the worktable supporting the target process object, in modifying the metal oxide film.

95. (Currently Amended): A method of modifying a metal oxide film formed on a surface of a target process object, the method comprising:

placing the target process object including the metal oxide film formed thereon on a worktable disposed in a process vessel;

enclosing the target process object on the worktable by a cover in the process vessel;

supplying a process gas containing at least one of O_2, ozone, and N_2O into the cover ~~process vessel~~, wherein the cover is configured ~~process gas is supplied~~ to form a horizontal gas flow of the process gas above the target process object in the cover ~~process vessel~~;

generating active oxygen atoms from the process gas in the cover ~~process vessel~~ by an active oxygen generating system provided on the process vessel; and

exposing the metal oxide film to the active oxygen atoms to modify the metal oxide film.

96. (Currently Amended): A method according to Claim 95, wherein the horizontal gas flow is formed between a gas delivery port and an exhaust port disposed opposite the gas delivery port~~, and the gas delivery port and the exhaust port are respectively disposed on two opposite sides sandwiching the target process object~~.

97. (Previously Presented): A method according to claim 96, wherein the gas delivery port comprises a plurality of gas delivery holes.

98. (Previously Presented): A method according to claim 96, wherein the active oxygen generating system comprises a system selected from the group consisting of a heating system configured to heat the target process object and a UV radiating system configured to irradiate the process gas with UV rays.

99. (Previously Presented): A method according to claim 95, wherein the active oxygen generating system comprises a UV radiating system configured to irradiating the process gas with UV rays, and the horizontal gas flow is formed between the UV radiating system and the target process object.

100. (Currently Amended): A method according to Claim 99, wherein the process vessel has a transmission window disposed at a ceiling, ~~the horizontal gas flow is disposed below the transmission window,~~ and the UV radiating system is disposed above the transmission window.

101. (Currently Amended): A method according to Claim 99, ~~further comprising: a container-shaped lid having an~~ wherein:

the cover has a lower open end portion ~~to cover~~ on an upper surface of the worktable, so as to enclose the target process object, and ~~having~~ has ~~a~~ UV transmission properties, and

~~wherein~~ the horizontal gas flow is formed in the cover ~~lid~~ and between a gas delivery port and an exhaust port disposed ~~opposite the gas delivery port, and the gas delivery port and the exhaust port are respectively disposed~~ on two opposite sides of the ~~lid sandwiching~~ cover with the target process object between the ports.